



Medical University Cured Of Boiler Explosion Ailments



Boiler: B&W D-type rated at 100psig, equipped with low Nox burner

Fuel: Natural Gas

+ Risk Reduction Highlights

- Emergency troubleshooting on site within 48 hours
- Explosion root cause identified and repaired
- Increased boiler reliability
- Creation of combustion system safety road map
- Increased safety and knowledge of personnel

+ Facility Information

The university medical center houses a 450-bed hospital and a number of ancillary buildings. The entire facility including the boiler house was taken over by the university in 1976; prior to this the county operated the site. The boiler house facility consists of three boilers, two of which are Babcock and Wilcox, D-type water tube boilers. All of them make saturated steam at about 100 psig. The boilers operate primarily on natural gas.

+ Explosion Background

The medical center had suffered three boiler explosions prior to any involvement with CEC Combustion Services Group (CEC). "Number one boiler had blown up twice and number two had blown up once" the medical center's facility manager explained. A major insurance company's consultant assigned to the site, informed the client about CEC.

The two B&W boilers were retrofit in 1991 with low Nox burners. The client also had a controls upgrade after the first explosion in 1993. Then in 1997, after the second explosion, an oxygen trim system was added. The last explosion occurred in late 2002. In all three cases, the wind box burner sections had been damaged when the boilers experienced low oxygen levels (very fuel rich conditions) at low fire. No fatalities or injuries had occurred to date, but time was running out.

"If CEC had not intervened, it is very likely that a fourth explosion was only a matter of time."



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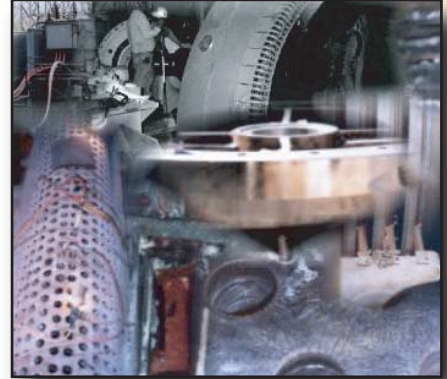
The Fuel-Fired Equipment Experts

Lowering Risk & Increasing Reliability

+ Root Cause Solutions

CEC's team of engineers, tuning and controls technicians identified the root cause of the explosions as an improperly designed boiler and inadequate repairs. Additional factors are listed below:

- Improper fuel/air ratio set up which made for very difficult and dangerous control of air fuel ratios at low fire.
- Improperly short purge time prevented safe evacuation of combustibles prior to light-off.
- Poor training and lack of preventive maintenance program prevented identification and resolution of dangerous combustion issues.
- Dangerous bypassing of important safety interlocks included airflow switches, jumper wires and failed switches.
- Numerous safety shut-off valves were leaking through when in the closed position and others had inoperable and/or missing shut-off handles.
- Lacking start-up, shutdown, and emergency procedures



+ Conclusion

The CEC team brought to an end a long history of explosive "near-misses". Based upon the recommendations, the site's management decided to shut down Boiler # 2 after the discovery of the safety deficiencies. There were many other safety issues, which needed attention, including preventive maintenance, training of staff, emergency procedures and gap analysis. After conducting various testing, inspection and analyses throughout the facility, a comprehensive long-term recommendation plan was presented to the client.

If the CEC team had not intervened it is very likely that a fourth explosion was only a matter of time. There had been shrapnel that went through walls in previous explosions. Explosions aren't good business for anyone. The team's involvement in this case has left behind a safer facility, a happy client, and a rock solid relationship; one where the risk of catastrophes and claims has been dramatically reduced.



CEC Combustion Services Group

CEC Combustion Services Group provides testing, training and risk reduction services to facilities utilizing boilers, process ovens and

and fuel-fired equipment. They are the experts in combustion systems, offering a complete line of services to create and implement corporate and worldwide combustion programs. The goal is to save lives, reduce costs and prevent explosions and outages worldwide.

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Road Map to a Combustion Safe Culture

- Risk and Gap Analyses
- Interlock and Valve Testing
- Customized Hands-on Training Programs
- Start-up, Shutdown and Emergency Procedures
- Preventive Maintenance Programs
- Third-party Design Review
- Root Cause Analysis
- Burner Tuning

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